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DEVELOPING AN IT CLUSTER: WHAT CAN SCOTLAND LEARN FROM AUSTIN, TEXAS?

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INTRODUCTION

Over the past 30 years Scotland has established a significant position in the electronics and information technology (IT) industries. With 48,900 employees, electronics employs 14% of the manufacturing workforce in around 400 companies[8]. They produce 20% of Scotland's manufacturing GDP and account for nearly one third of all manufacturing investment. A wide variety of IT industries have a presence in Scotland but its main strengths are in defence electronics, computers, semiconductors and telecommunication equipment. For example, over 30% of Europe's personal computers and 13% of its semiconductors are produced in Scotland. In addition, there is a small computer

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[8] *The employment figures are from 1996 ACOP data. IT is defined as Office Machinery and Computers, Electrical Machinery and Apparatus n.e.s and Radio, TV and Communication Equipment. The number of companies is taken from the 1997 Dun and Bradstreet database. This records 373 electronics companies. This will be something of an under-estimate because not all small companies will be registered. 400 is taken as a realistic estimate.*

software industry with approximately 2,000 employees in 200 companies[9].

Defining a cluster as 'a group of inter-related industries whose linkages mutually reinforce and enhance their competitive advantage', Porter (1990) has argued that strong clusters both improve the performance of individual companies and drive economic development. In what has become known as 'Silicon Glen', the IT industries are one of Scotland's str/nger clusters. Output (though not employment) has grown rapidly during the 1990s, they are highly profitable and, compared to the rest of manufacturing, pay above-average wages. In part reflecting its existing strengths in electronics, Scotland continues to attract a flow of IT inward investment including, for example, the recently announced Cadence project which plans to employ up to 1,700 highly skilled people in the emerging field of system-on-chip technology. (Scottish Enterprise 1998). Despite short-term fluctuations especially in the semiconductor industry, globally the IT industries will continue to grow rapidly. Nevertheless, concern remains over their longer-term contribution to the Scottish economy.

While a small indigenous electronics sector has developed (Turok 1993b), its exports, profitability and growth are low. The cluster remains dominated by overseas-owned companies, and growth is driven by inward investment. With 56% of IT employment, overseas companies account for 77% of the cluster's output and over 85% of investment. During the 1990s, they have achieved very rapid but essentially jobless growth. The next generation of many IT products, such as notebook computers and flat panel displays, are not produced in Scotland

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[9] *The UK Standard Industrial Classification does not have a separate software industry. These figures, using the US SIC system, are taken from the 1997 Dun and Bradstreet database. They under-estimate the industry marginally. There is, of course, more extensive software capacity in the IT manufacturing companies and in other Scottish based companies.*

and, with a few notable exceptions, the companies have limited decision-making autonomy, product development or R&D. Local sourcing, as a percentage of total purchases, remains low with few of the higher value and more sophisticated components produced in Scotland (Turok 1993a). Given its peripheral location in Europe (its main market), the cluster remains vulnerable to growing competition for assembly and manufacturing inward investment from lower cost producers such as Hungary and even China.

These problems have been long recognised. For example, while continuing to focus on inward investment, the 1982 Booz, Allen, Hamilton study for the Scottish Development Agency argued that more attention should be devoted to technology, product development, R&D and the indigenous sector. However, solutions have proved elusive. To address some of these issues, Scottish Enterprise is adopting a cluster approach to industrial strategy. The theory, approach and rationale (including how it relates to Scotland's IT industries) are outlined in the article by Botham and Downes elsewhere in this issue of **Scoittish Affairs**. One element of the approach is benchmark studies of successful regional clusters. This paper draws on the finding of a benchmarking study of Austin (Texas), one of the most successful American IT clusters, to identify potential policy implications for growing and sustaining Scotland's IT industries into the next century.

THE AUSTIN IT INDUSTRIES

Austin is the capital of Texas. Driven by the growth of the IT industries, its population has increased from 270,000 in 1961 to 1.2m today. The economy is dominated by the IT cluster with employment having risen from 8,000 in the mid-1970s to 104,000 in 1997. This represents 20% of the city's total employment.

The Cluster Today

Today Austin has a number of inter-related and mutually reinforcing IT industries. As illustrated in figure 1, its main strengths are in semiconductors, computers (mainly but not exclusively PCs), software and IT services such as R&D, software consultancy, systems integration, data processing, internet services and technical support call centres. Supporting the manufacture of semiconductors, a number of companies produce silicon wafer, photomasks and specialist chemicals. There is also a strong semiconductor equipment industry in the city. Chips are designed and purchased for a wide range of applications including the computer industry. Linked to computing, the city has considerable strengths in PCB assembly, printers, monitors, storage devices, disk drive controllers, graphic accelerators, passive components and precision materials.

In contrast to Scotland, the software and IT service industries are well developed. While manufacturing companies account for 50,000 (which is 66% of the city's total manufacturing employment), software developers and IT services account for just over 50% of the cluster's employment. The software industry has strong links with the city's semiconductor and computer industries through its involvement in applications and operating systems. The cluster has a combination of manufacturing and product design and development and more basic R&D. IBM's Power Mac PC, for example, was developed in the city.

The Early Years

During the 1960s the city's strategy was to attract clean, light manufacturing and assembly. Amongst the arrivals were Burroughs (1966), IBM (1967), Texas Instruments (1968) and Control Data Corporation (1970). This focus on the IT industries encouraged the Chamber of Commerce, which is responsible for the city's inward investment function, to target IT and build up

the city's infrastructure to support these industries. Throughout the 1970s there was a steady flow of, to use the American term, relocations into the city including Motorola, AMD, Data General, Digital, Siemens and Westinghouse Electric Corp.

Figure 1
IT in Austin: 1997 Firms and Employment by Industry

	Firms	Employment
Manufacturing		
Computers and Peripherals	13	13,000
Electronics and Components	160	13,000
Semiconductors and Suppliers	73	23,000
Other	24	1,600
Sub Total	270	50,600
Services and R&D		
Computers, Electronics, Components	600	15,000
Semiconductors	134	4,000
Software Developers	600	21,500
Other Services	116	12,700
Sub Total	1,450	53,200
Total IT Cluster	1,720	103,800

Source: Angelou Economic Advisors Inc. (1998).

In the mid-1960s the State Governor brought together a high profile committee to examine how the University could contribute more to the State's economic development. Subsequently, the University of Texas at Austin (UT) appointed George Kozmetski as the Dean of the Business School. As a wealthy, former entrepreneur from the Massachusetts electronics industry, Kozmetski arrived with the explicit idea of building Austin into a 'high tech' technopole. In 1977 he founded the Institute for Innovation, Creativity and Capital

(IC2) as an action-orientated research centre within the UT. Through its research and writings, the Institute did much to create a vision of Austin as a 'high tech', innovation-driven city. By the early 1980s the need to upgrade the cluster to include more research, design and development (RD&D) was widely accepted (Smilor et al 1988). The first major success was the attraction of the Micro-electronics and Computer Technology Corporation (MCC) in 1983.

Microelectronics and Computer Technology Corporation

MCC was one of the earliest research consortia in the US. By the early 1990s it employed 320 with an annual research budget of $70m. With the reduction of the government's initial matching funding, its research budget has declined somewhat to around $40m per annum. In the face of stiff opposition from other US cities, according to the President of MCC, 'Austin won by putting together a public-private partnership'. Led by the Chamber of Commerce, the partners offered a highly attractive location package. With money raised through a public campaign matched by State Government funding, UT agreed to appoint 32 $1m endowed 'super chairs' relating to MCC's research and provided a 200,000 sq. ft. campus property essentially rent free for 10 years. To assist MCC recruit and attract staff to Austin, the Chamber's members put together a $20m mortgage assistance package for MCC employees, helped find their spouses employment and offered perks such as free luncheon vouchers (Gibson and Rogers 1994).

The arrival of MCC transformed the image of the city and, within the IT industries, put Austin on the R&D map. With little subsidy, a number of large corporate R&D projects followed including IBM, Apple and 3M (electronic instrumentation and measurement). The MCC success was repeated in 1987 when the city attracted Sematech, a research consortia for the semiconductor industry. A similar approach and location package was used including the appointment by UT of 32 'super

chairs' to build up its relevant research capacity. In 1997, with its initial Federal Funding discontinued, it employed 620 people with a research budget of $173m. Recognising that the US industry was losing out because of poor integration between chip design and the development of new equipment to produce them, Sematech concentrated its work on programmes bringing together semiconductor companies and equipment suppliers. One result is that a plethora of semiconductor equipment manufacturers has moved into Austin becoming part of what is now an extensive network of simultaneously competing and co-operating companies.

DIVERSIFICATION, COMMERCIALISATION AND ENTREPRENEURSHIP

By the early 1980s there were growing concerns over potential conflicts between the city's continuing growth and its quality of life, the danger of over-specialisation and the threat to its basic manufacturing and assembly from lower cost regions. A development strategy for the city launched in 1985 (SRI International 1985) argued that preserving a high quality living and working environment was essential to Austin's economic success. It illustrated how potential conflicts could be resolved and stressed the need for economic diversification. The latter was to be achieved, not by attracting unrelated manufacturing industries, but by building on the city's electronics strengths to develop a variety of IT service industries including software, information products, data processing, electronic publishing and communication services. These industries were targeted because they would benefit from the city's IT manufacturing and, simultaneously, strengthen the competitive position of the manufacturing sector. In particular, they would help attract further manufacturing R&D. The recommended means were targeted inward investments (especially for R&D), innovation (especially through commercialising the city's R&D), creativity

and development of an indigenous sector through entrepreneurship.

While the subsequent 15 years saw a continuing flow of manufacturing companies into the city, the growth process has been transformed in three fundamental ways. First, most growth has come from software and IT services. In 1985, these industries had minimal presence in Austin. With just over 50% of the cluster's employment, they now provide 53,000 jobs in 1,450 companies. Second, manufacturing and assembly, which initially dominated the cluster, has been upgraded with a strong emphasis on product design and R&D. In the early 1980s few patents were taken out by institutions or companies located in Austin. By 1990/92, the annual number had risen to 403 which further increased to 704 for the period 1994/96 (Angelou Economic Advisors Inc 1997). Austin's IBM facilities are now the company's largest source of patents.

The third fundamental change, the increased role of entrepreneurship, has been an important source of innovation, contributed significantly to the growth of the software and IT service industries and created an indigenous sector. Prior to 1980 a small number of start-up companies, many with their origins directly or indirectly in UT, had established a small indigenous sector. One of the earliest, a 1955 UT defence electronics spin-off, became the city's first Fortune 500 company. CompuAdd was set up in 1982 and, in 1984, Michael Dell left UT to establish Dell Computers which now employs over 12,000 in the city. Since 1985 some 45% of all new jobs in the cluster have been created by indigenous start-ups. By the early 1990s there were 70 start-ups per year and by 1995/97 this had risen to 161 per year. Of these 26% were in manufacturing (computers, electronics etc.) with the remaining 74% being software companies (Angelou Economic Advisors Inc 1998). While there is no directly comparable Scottish figures, the 1997 Dun and Bradstreet database shows just 285 indigenous IT

companies set up since 1985 of which 56% were manufacturing and 44% were software companies.

While one or two venture capital companies had been set up in Austin (mainly by individuals moving in from the Massachusetts industry) during the 1980s, in the early 1990s venture capital was still widely seen as a serious constraint. The Texas Capital Network (a matchmaking service for high tech entrepreneurs and business angels) was launched in 1989. Along with its annual Investment Forum, it claims to have raised $150m investment for local companies between 1996 and 1998. As the deal flow has increased, so the venture capital industry has expanded. There are now 52 sources of venture capital in the city which, in 1997, invested $234m in 56 companies[10]. During the 1990s, 31 Austin companies have gone public through an IPO (though not all are IT companies) and there has been several high profile, high value trade sales within the IT cluster. The significant returns to the entrepreneurs and initial investors have further increased the supply of venture capital which, in turn, has fuelled the entrepreneurial process.

The attraction of inward investment and the development of entrepreneurship within the cluster have been mutually reinforcing. The key has been the attraction of product design and R&D. This has attracted highly skilled people into the city. Despite the large and growing output of IT graduates from UT, many jobs have been filled through national (and even international) recruitment. Indeed, around 30% of relocating jobs involve people transferring from elsewhere in the US. It is product development and R&D staff, not production line employees, who have the technological and commercial expertise to start new IT companies. Consequently, inward

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[10] *There are no comparable Scottish figures. However, British Venture Capital Association data for 1997 show there were 40 early stage (the nearest equivalent to the US definition of venture capital) investments in Scotland amounting to £22m. However, few of these were in the IT industries.*

investment has added to the number of incubator organisations in the city. For example, MCC was the origin of several high profile start-ups in the late 1980s. It also introduced into Austin an explicit commitment to, and developed skills for, commercialising science and technology. Similarly, IBM, especially during the downturn in the early 1990s, was the source of many software start-ups. Subsequently, the small companies themselves became a source of further high tech entrepreneurs. In turn, the creation of an innovation-driven cluster is attracting high quality inward investment. With its well-developed specialist labour market, technological strengths, access to sophisticated customers and range of supporting services, Austin is now a 'place to be' for both young 'techies' and IT companies. For example, Motorola recently relocated its semiconductor HQ to Austin.

FUTURE DEVELOPMENTS

The city's development strategy was updated in 1998 (ICF Kaiser 1998). It continues the main themes of the 1985 strategy but adopts a more explicit cluster perspective. Seeing computers and semiconductors as mature industries, it focuses on emerging industries from within the cluster. In addition to transaction services and logistics, both of which are increasingly dependent on the IT industries, these are identified as IT-related biomedical products, creative industries (music, video and independent films) and multimedia. Central to the strategy is the creation and exploitation of linkages and synergy. The creative industries, for example, are increasingly dependent on software and multimedia while multimedia is emerging from the city's computer, software, games and creative industries. As success inevitably pushes up wage rates, the city will need to be even less reliant on basic manufacturing, assembly and inward investment. The route to success is seen as highly targeted inward investment, entrepreneurship and the creation of new

indigenous firms, the commercialisation of science and technology and aligning the city's business infrastructure (and especially UT research and education) with the needs of these emerging industries.

MAKING IT HAPPEN

Compared to Silicon Valley and Route 128 (the origin of many relocations into the city), both wage rates and living costs (especially housing) are significantly lower in Austin. While wages are lower, Austin offers higher real incomes and a very affordable high quality living and working environment for skilled workers in the cluster. Nevertheless, the cluster is not simply the product of market forces. To quote the Chamber of Commerce (p. 34 1998).

> Prosperity does not just happen - to individuals or cities. And it does not continue without careful planning and nurturing.

Many other US cities had Austin's cost and environmental advantages but did not develop a successful IT cluster. Austin's success reflects a shared vision and strategy, commitment and implementation by key players, acting in partnership. The key players include the University and the private sector operating through the Chamber of Commerce.

The University

As a State-funded university, UT is more traditional than MIT and Stanford and, indeed, could not financially benefit from its research until the 1980 Bayle-Dole Act. Nevertheless, it has played an active role in the cluster's development being the incubator for many of the early high tech new-starts which, in turn, have spawned a second and third generation of start-ups (Gibson and Smilor 1991). It was an important contributor to the packages which won MCC and Sematech and over time it has built up and aligned its research and teaching to the needs of the cluster. Its graduates, research and active participation are now

one of the major factors which attracts 'high quality' inward investment to Austin. At the same time, participation in the cluster has helped transform UT from an average US university into one of its leading research universities. For example, its ability to attract high quality students has improved dramatically and engineering research endowments rose from under $1m in 1975 to over $55m by the early 1990s.

The University has provided much of the intellectual leadership underpinning the cluster's development. It helped stimulate interest in entrepreneurship through its teaching programmes and in 1984 introduced Moot Corp (a start-up business plan competition for students) which is now a world-wide competition run from Austin. IC2 has spawned a number of specialist research and teaching centres including the Centre for Technology Venturing, the Centre for Communication Technology and Society, the Technology Transfer Research Group and the Centre for Commercialisation and Enterprise (C2E). The latter, set up in 1993, developed and runs the first US PhD programme in commercialising science and technology. The University's research and publications have not only helped steer the city's development as an IT technopole but they have also put Austin on the global IT map.

As an action-orientated research centre, IC2 is committed to turning theory into practice. It has initiated (and continues to support) much of the cluster's business infrastructure including the Texas Capital Network (TCN), the Austin Entrepreneurs' Council, the Austin Software Council and the Austin Technology Incubator (ATI). With over 600 members, the Software Council, for example, provides networking opportunities for the entire software community (i.e. entrepreneurs, companies, academics, financiers and service providers), mechanisms for spreading information and knowledge throughout the community and specialist business advice, training and education. ATI was set up in 1989 as an

8,000 sq. ft joint venture between the City Council, Chamber of Commerce, the University and several local companies. It is now an 80,000 sq. ft facility with 20 tenants of which 18 are IT companies. It houses TCN and is an integral part of both the academic and business community. Faculty see it as 'an experiential learning lab' with staff and students undertaking projects with, and for, its tenants. Business support and advice are also offered by local service providers and it houses much of the city's entrepreneurship education and training. Its 45 graduate companies employ 1,300 people and have sales of over $132m. Perhaps even more important than its direct impact is its role as a hub in the city's IT networks and the high profile it gives high tech entrepreneurship and academic-industry links. Further specialist incubators are currently being planned for, for example, multi-media.

Chamber of Commerce

The Chamber is a lead player in Austin's economic development. It commissioned and co-ordinated both the 1985 and 1998 development strategies. It led the bids for MCC and Sematech and made important contributions to the relocation packages. Through its economic development department, it promotes the city and runs the inward investment function. It mobilises private sector participation with many of its activities and services being delivered by its members. For example, members make visits to potential inward investors both in, and increasingly outwith, the US. They also fund (annual budget nearly $1m) Advantage Austin to initiate economic development projects. Again with active member participation, these include programmes such as Adopt-a-School, Job Shadowing, School-to-Work, a Tech Prep Consortia (preparing school leavers for jobs in high tech), trade fairs, seminars and, in 1997, the first Jobs Fair in Boston to enable software companies to recruit and attract staff to Austin. It actively supports music entrepreneurs and a variety of ethnic minority programmes.

Members' participation is based on long-term self-interest. For example, recognising growth as the route to increased demand, participants in inward investment missions are usually service providers such as accountants, property entrepreneurs and utilities.

Governance and Partnerships

Participation via partnership is long established in Austin. The key players operate within a shared vision of Austin's future. The 1985 strategy is widely accepted and guides the actions of key players. It established the idea that strategic choices (rather than a simple reliance on market forces) are a necessity. It presented an integrated view of how different policy areas inter-relate (e.g. economic development, education, social affairs, physical infrastructure etc.) and illustrated the need to include the less skilled and ethnic minorities. It argued that it was in the private sector's interest to be involved in the full agenda and to take on greater responsibility for Austin's economic, community and social development. These arguments are accepted by, and reflected in, the Chambers activities. Given the private sector view, public-private partnerships are the norm.

Without, until recently, using cluster terminology explicitly, the basic cluster ideas are well understood and embedded in the city's business culture. The vision of Austin as an IT centre is widely accepted. The benefits for industrial companies arising from achieving critical mass, attracting and developing IT related industries including customers and suppliers, strengthening academic research and aligning it with the needs of the cluster, competing and simultaneously co-operating with local rivals are generally recognised. Consequently, participation in both cluster governance and individual projects reflect a recognition of long-term self-interest.

This shared vision and understanding provides a context within which partnerships can work effectively. Government plays an important but not controlling role in the governance of the

cluster. Both the Federal and State Governments have provided considerable finance supporting both University and corporate R&D. The State Government supports many of the local initiatives. For example, it provided matching funding for the MCC and Sematech bids and used its political clout to influence the decision. Subsidy is significant but highly targeted. The State provides much of the funding for projects initiated by the Chamber of Commerce. Local government has played a supportive role largely through the provision of infrastructure and by pioneering the electronic delivery of its services. This has enhanced the city's IT image, generated skills and created markets for local companies.

SOME LESSONS FOR SCOTLAND

As with technology, policy cannot be simply transferred. At the very least it needs to be transformed to 'fit' local circumstances. Austin also has a number of advantages which cannot be replicated in Scotland. As a young city dominated by the IT industries, Austin has fewer 'historical' constraints, established vested interests, competing demands on resources and problems of integrating cluster and cross-cluster policies such as entrepreneurship, training, research and commercialising science and technology. In Scotland, these policies may need to relate to a number of clusters rather than simply the IT industries. Furthermore, policy recommendations must be based on more than a single benchmarking study. Nevertheless, given the origin of Austin's IT cluster in manufacturing inward investment, its specialisms in computing and semiconductors and its undoubted success, Austin is a highly suggestive benchmark for Scotland.

Rather than diversifying the economy by attracting industries with little presence in Scotland, the Austin experience confirms the potential benefits of building on the existing IT industries through a cluster approach. This helps create the critical mass

necessary to support specialist skills, labour markets, research and technology centres and other specialist infrastructures such as logistics services. With Scotland's IT industries less than half the size of the Austin cluster and accounting for just 2.5% of total employment, there is little danger of over-specialisation. Furthermore, a cluster approach offers the opportunity to diversify the economy through new IT industries and a greater range of functions such as R&D. Here Austin illustrates the importance of focusing on software developers and IT service industries both of which are under-developed in Scotland. In contrast to the strong linkages in Austin, the Scottish IT industries are less well networked and inter-related. For example, the semiconductor industry neither designs nor produces chips for the computer industry while the software community has little interest in, or linkages with, the manufacturing sector. Austin suggests more needs to be done to create and exploit linkages and potential synergies between Scotland's IT industries.

Austin also shows that, rather than being mutually exclusive, inward investment and indigenous business development can be mutually reinforcing. An integrated package of policies is required to develop the cluster including a focus on attracting R&D, strengthening Scotland's research and technology infrastructure, commercialising science and technology and promoting entrepreneurship. A high level of new firm formation is the route to the creation of an indigenous sector. Currently, there are many fewer IT new-starts in Scotland than Austin. Often a Scottish excuse is the absence of venture capital. However, Austin illustrates that much can be achieved prior to the creation of a local venture-capital industry and that, as entrepreneurship increases, a venture capital industry can be developed. To stimulate entrepreneurship within the cluster, the number and effectiveness of incubator organisations is

important. Here, inward investment can play an important role by attracting product development and R&D.

Austin offers perhaps five strong hints on how this might be achieved. First, IT related RD&D must be targeted explicitly. Winning initial projects may require large one-off location packages including more than job-related financial assistance. Assistance may need to be more highly selective, less concerned with short-term job creation and more concerned with longer-term developmental impacts. Second, one or two initial projects could put Scotland on the R&D map. Currently, it is not seen by the IT industries as a place in which to undertake R&D. In this context, ensuring Cadence does for Scotland what MCC did for Austin is essential. Third a strong research and technology infrastructure is essential with actively involved universities whose activities are aligned with the needs of the cluster. Fourth, and perhaps most controversially, policies which help companies recruit and attract into Scotland highly skilled individuals and 'young techies' should be introduced. It is such in-migrants who have driven the growth of the Austin cluster. This contrasts with the traditional Scottish approach of attracting 'unfilled' jobs for the local community. Fifth, and finally, policies which encourage and enable the commercialisation of science and technology and promote entrepreneurship within the cluster creates an environment which attracts high quality inward investment.

Austin's success, notwithstanding its US context, is not simply the product of market forces. Of particular relevance to Scotland, Austin illustrates the importance of a shared vision and strategy, cluster governance, active participation of the industrial, financial and academic communities, long term commitment with an evolving strategy and partnerships. Based on long-term self-interest, all key players (perhaps through organisations such as the Scottish Electronics Forum) need to be involved in both strategy development and its implementation.

The key players include inward investors, local entrepreneurs, academics, service providers, financiers, all cluster industries and relevant government departments and agencies. The focus needs to be on action and upgrading the cluster rather than simply lobbying and protecting the short-term interests of the larger established companies. Currently, private sector involvement tends to be somewhat passive (for example, individuals sitting on public sector development agency boards) and looks to the government (or its agencies) for leadership. As illustrated by the Austin Chamber of Commerce and IC2, somebody needs to undertake a 'developmental' function for the cluster but it need not be government.

Readers will, no doubt, draw their own lessons from the Austin story. But two final lessons seem worth noting. First, compared to Austin, Scotland has been slow to recognise and exploit new opportunities such as software, IT services and multi-media. While policy has evolved (as reflected in the Cadence project), the reality is that the attraction of mobile manufacturing remains the central plank of policy. Within a long-term strategy and vision, Austin's experience suggests Scotland needs to be 'quicker to market'. Currently Scottish thinking and policy lags too far behind successful IT clusters such as Austin. For example, Scotland has been much slower to recognise the importance of entrepreneurship and commercialising science and technology. Entrepreneurship still does not feature strongly in the national software strategy. Second, there are fewer IT cluster initiatives in Austin than in Scotland but they are generally larger, more visible, more effectively implemented and better integrated and networked with other elements of the cluster's infrastructure. There is nothing in Scotland to rival, for example, the Austin Technology Incubator. Perhaps in Scotland more attention should be devoted to the implementation of strategy and the effective delivery of initiatives and projects.

To anticipate a potential response – 'But the comparison with Austin is not fair'. However, at least in this context, economic development is not about fairness. As a benchmark, Austin should raise Scottish expectations and ambitions for its IT industries and illustrate the policies and challenges which could be involved in building and sustaining an internationally competitive IT cluster.

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